Trigonometry Questions for SSC CGL Tier 1 & 2 and 10+2 Exams

TRIGONOMETRY QUIZ 7

Direction: Study the following questions carefully and choose the right answer:

(1). The angles of a triangle are (x + 5)°, (2x – 3)° and (3x + 4)°. The value of x is

A. 30 B. 31

C. 29 D. 28

(2). The value of cot 10° . cot 20° . cot 60° . cot 70° . cot 80° is

A. 1 B. –1

C. √3 D. $\frac{1}{\sqrt{3}}$

(3). If Θ be an acute angle and 7 $\sin^2$ Θ + 3 $\cos^2$ Θ = 4, then the value of tan Θ is

A. √3 B. $\frac{1}{\sqrt{3}}$

C. 1 D. 0

(4). The value of $\sin^2 1° + \sin^2 5° + \sin^2 9° + ... + \sin^2 89°$ is

A. $11\frac{1}{2}$ B. $11\sqrt{2}$

C. 11 D. $\frac{11}{\sqrt{2}}$

(5). The numerical value of $cot\ 18° \left(cot\ 72°\ cos^2 22° + \frac{1}{tan\ 72°\ sec^2 68°}\right)$ is

A. 1 B. √2

C. 3 D. $\frac{1}{\sqrt{3}}$

(6). If tan 15° = 2 – 3 , the value of tan 15° cot 75° + tan 75° cot 15° is

A. 14 B. 12

C. 10 D. 8

(7). If x, y are acute angles, 0 < x + y < 90° and sin (2x – 20°) = cos (2y + 20°), then the value of tan (x + y) is:

A. $\frac{1}{\sqrt{3}}$ B. $\frac{1}{\sqrt{3}}$

C. √3 D. 1

(8). If ∠A and ∠B are complementary to each other, then the value of $\sec^2 A + \sec^2 B - \sec^2 A \cdot \sec^2 B$ is

A. 1 B. – 1

C. 2 D. 0

(9). $\sin^2 5° + \sin^2 6° + ... + \sin^2 84° + \sin^2 85° = ?$

A. $39\frac{1}{2}$ B. $40\frac{1}{2}$

C. 40 D. $30\frac{1}{\sqrt{2}}$

(10). $\sin^2 5° + \sin^2 10° + \sin^2 15° + ... + \sin^2 85° + \sin^2 90°$ is equal to

A. $7\frac{1}{2}$ B. $8\frac{1}{2}$

C. 9 D. $9\frac{1}{2}$

Correct answers:

1	2	3	4	5	6	7	8	9	10
C	D	B	A	A	A	D	D	B	D

Explanations:

1.

Sum of angles of a triangle = 180°

∴ x + 5 + 2x – 3 + 3x + 4 = 180°

⇒ 6x + 6 = 180°

⇒ 6x = 174°

⇒ x = 29

Hence, option C is correct.

2.

cot 10° . cot 80° . cot 20° . cot 70° . cot 60°

= cot 10° . tan 10° . cot 20° . tan 20° . cot 60°

[∵ cot (90° – Θ) = tan Θ & cot Θ . tan Θ = 1]

$= 1 \times 1 \times \frac{1}{\sqrt{3}} \qquad \left[\therefore \cot 60° = \frac{1}{\sqrt{3}}\right]$

$= \frac{1}{\sqrt{3}}$

Hence, option D is correct.

3.

$7 \sin^2 \Theta + 3 \cos^2 \Theta = 4$

$\Rightarrow 7 \frac{\sin^2 \Theta}{\cos^2 \Theta} + 3 = \frac{4}{\cos^2 \Theta} = 4 \sec^2 \Theta$

$\Rightarrow 7 \tan^2 \Theta + 3 = 4(1 + \tan^2 \Theta)$

$\Rightarrow 7 \tan^2 \Theta - 4 \tan^2 \Theta = 4 - 3$

$\Rightarrow 3 \tan^2 \Theta = 1$

$\Rightarrow \tan^2 \Theta = \frac{1}{3}$

$\Rightarrow \tan \Theta = \frac{1}{\sqrt{3}}$

Hence, option B is correct.

4.

No. of terms in $1 + 5 + 9 + ... + 89 = n$

$\therefore a + (n - 1) d = T_n$

$\Rightarrow 1 + (n - 1) \times 4 = 89$

$\Rightarrow (n - 1) \times 4 = 89 - 1 = 88$

$\Rightarrow n - 1 = 22$

$\Rightarrow n = 23$

Now,

$\sin^2 1° + \sin^2 89° + \sin^2 5° + \sin^2 85° + ... \text{ to 22 terms} + \sin^2 45°$

$= (\sin^2 1° + \cos^2 1°) + (\sin^2 5° + \cos^2 5°) + ... \text{ to 11 terms} + \sin^2 45°$

[$\because \sin (90° - \Theta) = \cos \Theta$]

$= 1 + 1 + ... + \text{to 11 terms} + (\frac{1}{2})^2$

[$\because \sin^2 \Theta + \cos^2 \Theta = 1$]

$= 11 + \frac{1}{2}$

$= 11\frac{1}{2}$

Hence, option A is correct.

5.

$\cot 18° (\cot 72° \cos^2 22° + \frac{1}{\tan 72° \sec^2 68°})$

$= \cot 18° \cot 72° \cos^2 22° + \frac{\cot 18°}{\tan 72° \sec^2 68°}$

$= \cot 18° \tan 18° \cos^2 22° + \frac{\tan 72°}{\tan 72° \sec^2 68°}$

[$\because \cot (90° - \Theta) = \tan \Theta$]

$= \cos^2 22° + \frac{1}{\sec^2 68°}$

[$\because \cot \Theta \tan \Theta = 1$]

$= \cos^2 22° + \cos^2 68°$

$= \sin^2 68° + \cos^2 68° = 1.$

[$\because \cos (90° - \Theta) = \sin \Theta$]

Hence, option A is correct.

6.

tan 15° cot 75° + tan 75° cot 15°

= $\tan^2 15° + \cot^2 15°$ ...(i)

[∵ cot (90° – Θ) = tan Θ & tan (90° – Θ) = cot Θ]

Given,

tan 15° = 2 – √3

$\therefore \cot 15° = \frac{1}{2-\sqrt{3}} =$

$\frac{2+\sqrt{3}}{(2-\sqrt{3})(2+\sqrt{3})} = 2 + \sqrt{3}$

From equation (i),

$\tan^2 15° + \cot^2 15°$

$= (2-\sqrt{3})^2 = (2+\sqrt{3})^2$

$= 4 + 3 - 2\sqrt{3} = 4 + 3 + 2\sqrt{3}$

= 14

Hence, option A is correct.

7.

sin (2x – 20°) = cos (2y + 20°)

⇒ sin (2x – 20°) = cos (90° – 2y – 20°)

⇒ sin (2x – 20°) = sin (70° – 2y)

$\Rightarrow (2x - 20°) = (70° - 2y)$

$\Rightarrow 2x + 2y = 70° + 20° = 90°$

$\Rightarrow x + y = 45°$

taking tan both side, we get

$\therefore \tan (x + y) = \tan 45° = 1$

Hence, option D is correct.

8.

$A + B = 90° \Rightarrow B = 90° - A$

$\therefore \sec^2 A + \sec^2 B - \sec^2 A \cdot \sec^2 B$

$= \sec^2 A + \sec^2 (90° - A) - \sec^2 A \cdot \sec^2 (90° - A)$

$[\because B = 90° - A]$

$= \sec^2 A + \text{cosec}^2 A - \sec^2 A \, \text{cosec}^2 A$

$[\because \sec (90° - A) = \text{cosec } A]$

$$= \frac{1}{\cos^2 A} + \frac{1}{\sin^2 A} - \frac{1}{\sin^2 A \cos^2 A}$$

$$= \frac{\sin^2 A + \cos^2 A - 1}{\sin^2 A \cos^2 A}$$

$$= \frac{1 - 1}{\sin^2 A \cos^2 A} = 0$$

Hence, option D is correct.

9.

Let the number of terms be n, then

$T_n = a + (n - 1)\, d$

$\Rightarrow 85 = 5 + (n - 1) \times 1$

$\Rightarrow n - 1 = 85 - 5 = 80$

$\Rightarrow n = 81$

$\therefore \sin^2 5° + \sin^2 6° + ... + \sin^2 45° + ... + \sin^2 84° + \sin^2 85°$

$= (\sin^2 5° + \sin^2 85°) + (\sin^2 6° + \sin^2 84°) + ... \text{ to 40 terms} + \sin^2 45°$

$= (\sin^2 5° + \cos^2 5°) + (\sin^2 6° + \cos^2 6°) + ... \text{ to 40 terms} + \sin^2 45°$

[$\because \sin (90° - \Theta) = \cos \Theta$]

$= 1 + 1 + \ldots \; to \; 40 \; terms + \left(\frac{1}{\sqrt{2}}\right)^2$

[$\because \sin^2 \Theta + \cos^2 \Theta = 1$]

$= 40 + \frac{1}{2}$

$= 40\frac{1}{2}$

Hence, option B is correct.

10.

$\sin^2 5° + \sin^2 10° + \sin^2 15° + ... + \sin^2 85° + \sin^2 90°$

$= (\sin^2 5° + \sin^2 85°) + (\sin^2 10° + \sin^2 80°) + ... \text{ to 8 terms} + \sin^2 45° + \sin^2 90°$

$= (\sin^2 5° + \cos^2 5°) + (\sin^2 10° + \cos^2 10°) + ... \text{ to 8 terms} + \sin^2 45° + \sin^2 90°$

[∵ sin (90° – Θ) = cos Θ]

$= 1 + 1 + \ldots \; to \; 8 \; terms + \left(\frac{1}{\sqrt{2}}\right)^2 + (1)^2$

$= 8 + \frac{1}{2} + 1$

$= 9\frac{1}{2}$

Hence, option D is correct.